

REMARKS

Claims 7-15 are presented for examination, with Claims 16 and 17 having been withdrawn from consideration. Claims 7 and 11, the independent claims, have been amended to define still more clearly what Applicants regard as their invention, in terms which distinguish over the art of record.

A Request for Approval of Drawing Changes is submitted herewith, in response to the objection to the drawings set out in paragraph 7 of the Office Action. The drawing changes proposed in the Request are believed to overcome this objection. Accordingly, entry of the proposed drawing changes, and withdrawal of the objection to the drawings, are respectfully requested.

The Office Action included an objection to the Abstract of the Disclosure based on its content and length. The Abstract has been amended accordingly, and therefore, withdrawal of the objection is respectfully requested.

The title has been amended to read as follows: --A METHOD OF MANUFACTURING AN INK JET HEAD--. Applicants respectfully submit that the title, as amended, is clearly indicative of the invention to which the claims are directed.

Claims 7 and 8 were rejected under 35 U.S.C. § 102(a) as being anticipated by the Applicants' Admitted Prior Art ("AAPA"). Claims 9 - 15 were rejected under 35 U.S.C. § 103(a) as being obvious from combinations of AAPA, U.S. Patent 4,722,824 to Wiech, Jr., and U.S. Patent 5,098,503 to Drake.

Applicants submit that amended independent Claims 7 and 11, together with the remaining dependent claims, are patentably distinct from the proposed combination of the cited prior art at least for the following reasons.

Claim 7 requires a method of manufacturing an ink jet head having a substrate which includes a plurality of energy generating elements for generating energy utilized to discharge ink, the substrate having a plurality of recessed portions, the plurality of recessed portions having a bottom surface located at a position which is lower than a position of a heat acting surface of the substrate, and a wall member joined to the substrate, the wall member having a plurality of flow passage walls which define a plurality of flow passages when the substrate is joined to the wall member, the energy generated by the energy generating elements acting on the ink to discharge the ink through the plurality of flow passages, the method comprising the steps of: providing the plurality of recessed portions in the substrate; fitting the recessed portions to the flow passage walls of the wall member by applying a force to the wall member along a direction in which the plurality of energy generating elements are arranged, thereby aligning the flow passages with the energy generating elements.

One important feature of Claim 7 is the recessed portions having a bottom surface located at a position which is lower than a position of a heat acting surface of the substrate. This feature is described in the specification at least at page 32, line 18 to page 33, line 13, with reference to Figures 5 and 6. This portion of the specification states in part that "the contact portion between the heater board and the flow passage wall 1109 is

disposed lower than a heat acting surface 1116 which is a surface portion along which heat is supplied to the ink from the electro-thermal transducer 1103 (in this invention, the direction directed to the substrate 103 is expressed as low for convenience and does not indicate an actual downward direction)” In other words, the contact surface 1119 of the heater board and the lower end portion of the flow passage wall 1109 of the ceiling plate is at a lower position relative to the heat acting surface 1116 if the substrate 103 is defined as being in the lower direction. (It is to be understood, of course, that the scope of Claim 7 is not limited to the details of this embodiment, which is referred to only for purposes of illustration.)

In contrast, AAPA does not teach or suggest such a feature. In reference to Figure 2 and page 2, line 4 to page 4, line 19 of the specification, AAPA discloses the flow passage wall joining surface 1115 being at a higher position relative to the heating portion 1116 if the substrate 103 is defined as being in the lower direction. Therefore, Applicants submit that nothing in AAPA would teach or suggest the recessed portions having a bottom surface located at a position which is lower than a position of a heat acting surface of the substrate, as recited in Claim 7. Accordingly, Applicants submit that Claim 7 is patentable over AAPA.

Independent Claim 11 includes the same feature of the recessed portions having a bottom surface located at a position which is lower than a position of a heat acting surface of the substrate as discussed above in connection with Claim 7. Accordingly, Claim 11 is believed to be patentable for at least the same reason as discussed above in connection with Claim 7.

A review of the other art of record has failed to reveal anything which, in Applicants' opinion, would remedy the deficiencies of the art discussed above, as references against the independent claims herein. Those claims are therefore believed patentable over the art of record.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual reconsideration of the patentability of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,



Attorney for Applicants

Registration No. 24,613

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3801
Facsimile: (212) 218-2200

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VERSION MARKED TO SHOW CHANGES TO CLAIMS

7. (Amended) A method of manufacturing an ink jet head having a substrate [having] which includes a plurality of energy generating elements for generating energy utilized to discharge ink [provided thereon], said substrate having a plurality of recessed portions, said plurality of recessed portions having a bottom surface located at a position which is lower than a position of a heat acting surface of said substrate, and a wall member joined to said substrate, said wall member having a plurality of flow passage walls which [partially] define a plurality of flow passages when said substrate is joined to said wall member, the energy generated by said energy generating elements acting [through said flow passages so as to act] on the ink to discharge the ink through the plurality of flow passages, [said flow passages being fully-defined when said substrate is joined to said wall member,] said method comprising the steps of:

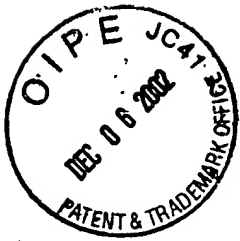
providing [a] the plurality of recessed portions in said substrate;

fitting said recessed portions to said flow passage walls of said wall member by applying a force to said wall member along a direction in which said plurality of energy generating elements are arranged, thereby aligning said flow passages with said energy generating elements.

11. (Amended) A method of manufacturing an ink jet head having a substrate [having] which includes a plurality of energy generating elements for generating energy utilized for discharging [an] ink [provided thereon], said substrate having a plurality of recessed portions, said plurality of recessed portions having a bottom surface located at a position which is lower than a position of a heat acting surface of said substrate, and a wall member joined to said substrate and having a plurality of flow passage walls which [partially] define a plurality of flow passages when said substrate is joined to said wall member, the energy generated by said energy generating elements acting [through said flow passages so as to act] on the ink to discharge the ink through the plurality of flow passages, [said flow passages being fully-defined when said substrate is joined to said wall member,] said method comprising the steps of:

providing [a] the plurality of recessed portions in said substrate;

fitting said recessed portions to said flow passage walls of said wall member by vibrating said substrate so that a force having at least a component acting in a direction in which said plurality of energy generating elements are arranged is applied to said wall member, thereby aligning said flow passages with said energy generating elements.



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VERSION MARKED TO SHOW CHANGES TO ABSTRACT

--[An] A method of manufacturing an ink jet head [includes] having a
substrate [on which] that has a plurality of energy generating elements used for generating
energy [utilized] that in turn is used to discharge ink [are provided thereof]. The substrate
has recessed portions separating the energy generating elements, and a wall member
[joined to the substrate] is provided having depending flow passage walls which are joined
respectively to the recessed portions. [The wall member has a plurality of flow passage
walls which partially define flow passages, and the energy generated by the] The energy
generating [element acts] elements [through the flow passage so as passages to] act on the
ink [to] and discharge [the ink] it through the flow passages. [The flow passages are fully
defined when the substrate is joined to the wall member. A recessed portion provided in
the substrate of the ink jet head is positioned between adjoining energy generating
elements. The recessed portion has a bottom surface located at a position which is lower
than a position for a heat acting surface of the substrate along which heat is transmitted to
the ink. The flow passage walls of the wall member abut the substrate at the bottom
surface. Consequently, any pressure wave generated by the energy generating element is
not released to an adjacent flow passage, and crosstalk between the adjoining flow
passages can be prevented. As a result, an ink jet head exhibiting excellent print quality
can be provided.]--

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